Determining FPKI Compliance to IETF-PKIX

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Outline

- Introduction to X.509 and the Profiles
- Definition of Compliance
- The Result of the Analysis
- Analysis Extension by Extension
- Summary and Next Steps



X.509 Profiles

- X.509 Is ISO Standard for Public Key Certificates
- X.509 Provides A Number of Implementation Options
- Profiles Determine Specific Implementation Based On Community Requirements
- IETF-PKIX Is The Internet Community



Compliance

- Compliance Based Upon
 - Inclusion of All Required Elements
 - Exclusion of All Prohibited Elements
 - Certificate and CRL Processing Based on PKIX and X.509



The Result

• FPKI Is Currently *Not Compliant* With PKIX



The Certificate Extensions



Authority Key Identifier

- Required in Both Profiles
- Both Constrain Use to keyIdentifier
- PKIX Recommends Deriving *keyIdentifier* From Public Key
- FPKI Derives Using SHA-1 Hash of Public Key
- FPKI is PKIX Compliant



Subject Key Identifier

- Required in Both Profiles in All CA Certificates
- Both Derive keyldentifier From Public Key
- FPKI is PKIX Compliant



Key Usage

- Required in Both Profiles as "Critical"
- *keyUsage* Definitions Are Similar But Not Identical
- FPKI Restricts *keyUsage* Combinations During Generation
- FPKI Adds Processing Requirements



Key Usage (cont.)

- Suggest:
 - Adopt PKIX Definitions
 - Retain Combination Restrictions
 - Retain Processing Requirements, But Restate
 digitalSignature and nonRepudiation Based On PKIX
 Definitions
- Suggestions Result in PKIX Compliance With Additional FPKI Requirements



Extended Key Usage

- FPKI Indicates No Requirements
- PKIX Defines Extended Key Usages, But Does Not Require Support
- Recommend Adopting PKIX Extended Key Usages, But Indicate That Support Is Optional



Private Key Usage Period

- FPKI Indicates No Requirements
- PKIX Recommends Against Use
- FPKI is PKIX Compliant



Certificate Policies

- FPKI Requires This Extension As "Critical"
- PKIX Does Not Indicate a Recommendation
- PKIX Defines Qualifiers; FPKI Adopts
 Them
- FPKI Is PKIX Compliant



Policy Mappings

- FPKI Requires Support
- PKIX Allows Support ("may be supported")
- FPKI Is PKIX Compliant; But FPKI Adds Requirement for Support



Subject/Issuer Alternative Name

- PKIX Allows The Extension To Be Critical
- FPKI Adds Requirements
 - Extension Must Be Non-Critical
 - Constrained to dNSName, directoryName, and uniformResourceIdentifier (add rfc822Name?)
 - Reject A Cert With If This Extension Is Critical and Does Not Include a *directoryName*
- Rejection of Otherwise Valid Cert Results In PKIX Non-Compliance



Subject Directory Attributes

- PKIX Does Not Recommend
- FPKI Support Is Optional
- May Carry MISSI-defined Access Control Attributes If Needed
- FPKI is PKIX Compliant



Basic Constraints

- Must Appear As A Critical Extension In Both Profiles
- Only For CA Certs; Not Recommended in EE Certs
- FPKI Is PKIX Compliant



Name Constraints

- Must Appear As A Critical Extension In All CA Certificates In Both Profiles
- PKIX Restricts Against Using minimum and maximum
- FPKI Adds Requirements:
 - Restricts Name Constraints to directoryName
 - Rejects A Cert If This Extension Is Critical And Contains Constraints Other Than *directoryName*
 - Rejection of Otherwise Valid Cert Results in PKIX Non-Compliance

Policy Constraints

- PKIX Does Not Make Any Support Recommendations
- FPKI Requires It Be Critical
- FPKI Is PKIX Compliant



CRL Distribution Points

- PKIX Recommends Support As a Non-Critical Extension (Does Not Require)
- FPKI Requires It As A Critical Extension
- FPKI Restricts distributionPoints to directoryName and uniformResourceIdentifier
- FPKI Is PKIX Compliant



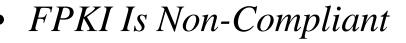
Authority Information Access

- PKIX Private Extension
- May Be Included In Subject Or CA Certs
- Must Always Be Non-Critical
- FPKI Does Not Support
- FPKI Is PKIX Compliant



Certification Path Validation

- FPKI Indicates Initial Values for Cert Path Processing Variables
- FPKI Lists Notifications For Expired Certificates And Provides the Option To Continue Processing
- FPKI Checks for Non-Empty Subject and Issuer Fields (Though PKIX Requires Non-Empty Subject and Issuer Fields In CA Certs)
- FPKI Ignores Unique Ids; PKIX Recommends Parsing and Comparing Unique Ids



The CRL and CRL Entry Extensions



Authority Key Identifier

- Required By Both PKIX and FPKI
- Both Require Use of keyIdentifier
- FPKI Is PKIX Compliant



Issuer Alternative Name

- FPKI Requires Support for Name Types dNSName and uniformResourceIdentifier
- PKIX Recommend Non-Critical; FPKI Requires Non-Critical
- Rejects A Cert If This Extension Is Critical And Contains Other Than *directoryName*
- Rejection of Otherwise Valid Cert Results in PKIX Non-Compliance



CRL Number

- PKIX Requires In All CRLs
- Optional for FPKI
- FPKI Is Non-Compliant



Delta CRL Indicator

- PKIX Makes No Recommendations
- FPKI Specifies No Support Requirements
- FPKI Is PKIX Compliant



Issuing Distribution Point

- PKIX Makes No Recommendations
- FPKI Requires For ICRLs
- FPKI Is PKIX Compliant



Reason Code

- Both PKIX and FPKI Strongly Recommend Use
- FPKI Is PKIX Compliant



Hold Instruction Code

- PKIX Defines Several Instruction Codes
- PKIX Requires Processing of Two Codes
- FPKI Does Not Require Support
- FPKI Is Non-Compliant



Invalidity Date

- PKIX Strongly Encourages Use
- FPKI Requires Use
- FPKI Is PKIX Compliant



Certificate Issuer

- PKIX Recommends That Implementations Recognize This Extension
- FPKI Requires This Extension For ICRL Entries
- FPKI Is PKIX Compliant



Algorithm Support

- PKIX Supports:
 - MD2, MD5, SHA-1 Hashes
 - RSA, DSA Signature Algorithms
 - RSA, Diffie-Hellman KM Algorithms
- FPKI Supports FIPS-Approved Algorithms
 - DSA and SHA-1



Summary

- The Desire..."The FPKI Complies with PKIX and states the following additional requirements"
- FPKI Additional Requirements
 - Key Usage
 - Combination Restrictions
 - Processing Requirements
 - Support Certificate Policies Extension as "Critical"
 - Support of Policy Mappings Extension



Summary (cont.)

- FPKI Additional Requirements (cont.)
 - Reject Critical Subject/Issuer Alternative Name Not Using directoryName
 - Reject Critical Name Constraints Not Using directoryName
 - Support Policy Constraints Extension As "Critical"
 - Support CRL Distribution Points Ext As "Critical"
 - Certification Path Processing Requirements
 - Support of Issuing Distribution Points CRL Extension



Support of Certificate Issuer CRL Entry Extension

Next Steps

- Can We Overcome Non-Compliance Issues
 - Alternative Name and General Name Processing
 - Cert Path Validation Requirements
 - CRL Number and Hold Instruction Codes
- If So, Rewrite To Reflect PKIX Profile
- If Not, Update To At Least More Closely Align With PKIX